



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/574,507	09/05/2006	Jianjun Wang	047911-0103	2372

22428 7590 11/05/2009  
FOLEY AND LARDNER LLP  
SUITE 500  
3000 K STREET NW  
WASHINGTON, DC 20007

EXAMINER
----------

MEKHLIN, ELI S

ART UNIT	PAPER NUMBER
----------	--------------

1793

MAIL DATE	DELIVERY MODE
-----------	---------------

11/05/2009

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/574,507	<b>Applicant(s)</b> WANG ET AL.	
	<b>Examiner</b> ELI MEKHLIN	<b>Art Unit</b> 1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 9/11/2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 57-78 is/are pending in the application.
- 4a) Of the above claim(s) 65-74 and 77-78 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 57-64, 75 and 76 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 4/30/2006 is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

(1)

This is the first office action on the merits. The Preliminary Amendment filed April 3, 2006, has been entered. Applicant canceled claims 1-56 and added claims 57-78. No new matter has been entered.

(2)

### ***Election/Restrictions***

Applicant's election without traverse of Group I, Claims 57-64, 75 and 76 in the reply filed on September 11, 2009, is acknowledged.

Claim 65-74, 77 and 78 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on September 11, 2009.

(3)

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Art Unit: 1793

Claims 57-59 are rejected under 35 U.S.C. 102(e) as being anticipated by Mack et al. (U.S. Publication No. 2003/0224168).

With respect to **claim 57**, Mack teaches carbon nanosheets having a thickness of about 3.4 Angstroms, which is equivalent to 0.34 nanometers. Col. 14, Claim 16. 0.34 nanometers is less than 2 nanometers.

With respect to **claim 58**, Mack teaches that the carbon nanosheets have a thickness of 0.34 nanometers which is less than 1 nanometer. Col. 14, Claim 16. Mack further teaches that the carbon nanosheet comprises individual graphite (graphene) layers. Col. 14, Claim 16.

With respect to **claim 59**, Mack teaches that the carbon nanosheet comprises individual graphite (graphene) layers. Col. 14, Claim 16.

(4)

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

Art Unit: 1793

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 60 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mack et al. (U.S. Publication No. 2003/0224168) in view of Peigney et al. *Carbon*, (39) 2001 505-514.

With respect to **claim 60**, Examiner notes that the statement “the carbon nanosheet is a freestanding nanosheet disposed on its edge on a substrate” is a statement of intended use that does not further limit the claim language. Any carbon nanosheet meeting the structural limitations of the claim is also capable of being disposed on its edge on a freestanding substrate.

Mack teaches that the carbon nanosheet has lateral dimensions of between 1 to 2 micrometers which is within the range of 100 nm to 8 micrometers. Col. 14, Claim 16. Although Mack does not refer to either of these lateral dimensions as the height of the sheet, a person having ordinary skill in the art at the time of invention would have appreciated that height, width and length designations are based on the perspective of

Art Unit: 1793

the artisan and are used to accurately distinguish between lateral dimensions.

Accordingly, the carbon nanosheet has a lateral dimension of 1 to 2 micrometers and the lateral dimension can be considered the height when viewed from the appropriate perspective.

Although Mack teaches a carbon nanosheet meeting the structural limitations of the presently claimed nanosheet, Mack is silent as to the nanosheet's specific surface area.

However, Peigney, which deals with nanostructured carbon materials, teaches that nanostructured carbon materials can be synthesized with a specific surface area of  $1315 \text{ m}^2/\text{g}$ . Page 508, Col. 2. Additionally, a person having ordinary skill in the art at the time of invention would have appreciated that the specific surface area of a compound influences the effectiveness of a structure because the greater the specific surface area the greater the amount of reactive area that is available in the structure.

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of invention to produce a carbon nanosheet taught by Mack with a specific surface area of between  $1000 \text{ m}^2/\text{g}$  and  $2600 \text{ m}^2/\text{g}$  because Peigney teaches that such a specific surface area is possible and a person having ordinary skill in the art at the time of invention would have appreciated that the specific surface area of a structure correlates to the effectiveness of the structure because the greater the specific surface area the more available area in the structure to react with other structures.

Finally, Mack teaches that the carbon nanosheet comprises individual graphite layers, meaning the nanosheet is in substantially pure form. Col. 14, Claim 16.

(5)

Claims 61 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mack et al. (U.S. Publication No. 2003/0224168) in view of Gao et al. (U.S. Patent No. 6,361,861),

With respect to **claim 61**, Mack teaches a carbon nanosheet with a thickness of less than 2 nanometers but is silent as to whether a plurality of the nanosheets are aligned.

However, Gao, which deals with nanostructured carbon materials, teaches that aligning a plurality of nanostructured carbon materials allows for their use in flat panel displays. Col. 1, Lines 30-31.

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of invention to align a plurality of the nanosheets taught by Mack because Gao teaches that doing so allows for their use in flat panel displays.

With respect to **claim 75**, Mack and Gao, as combined above, also teach that carbon nanostructured materials, such as carbon nanosheets can be used in field emission devices. Col. 1, Lines 17-18.

(6)

Claims 62 and 76 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shang et al. *Chemical Physics Letters* 358 (2002) 187-191 in view of Peigney et al. *Carbon*, (39) 2001 505-514.

Art Unit: 1793

With respect to **claim 62**, Shang teaches a carbon nanoflake. Abstract.

Although Shang teaches that the nanoflake has a large surface-volume ratio, Shang is silent as to the specific surface area of the nanoflake.

However, Peigney teaches that carbon nanostructured materials can have a specific surface area of  $1315 \text{ m}^2/\text{g}$  and a person having ordinary skill in the art at the time of invention would have appreciated that the greater the specific surface area, the more effective the carbon nanoflake is in hydrogen absorption, which Shang teaches is one of the many uses of carbon nanoflakes. Peigney, Page 508, Col. 2; Shang, Page 187, Col. 2.

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of invention to create a nanoflake, as taught by Shang, with a specific surface area of  $1315 \text{ m}^2/\text{g}$  because Peigney teaches that such a specific surface area is possible and a person having ordinary skill in the art at the time of invention would have appreciated that the specific surface area of a nanoflake directly correlates with its use as a hydrogen absorption compound because the larger the specific surface area, the more hydrogen can be absorbed.

With respect to **claim 76**, Shang and Peigney, as combined above, teach that carbon nanoflakes can be used in hydrogen absorption articles. Shang, Page 187, Col. 1.

(7)

Claims 63 and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shang et al. *Chemical Physics Letters* 358 (2002) 187-191 in view of Peigney et al.



Art Unit: 1793

*Carbon*, (39) 2001 505-514 as applied to claims 62 and 76 above, and further in view of Mack et al. (U.S. Publication No. 2003/0224168).

With respect to **claim 63**, Shang and Peigney, as combined above, teach a carbon nanoflake but are silent as to its dimensions.

However, Mack teaches that carbon nanostructured material can be synthesized with thicknesses of 0.34 nanometers, which is less than 10. Claim 14.

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of invention to produce the carbon nanoflakes taught by Shang and Peigney, as combined above, at a thickness of less than 10 nanometers because Mack teaches that thickness as little as 0.34 nanometers could be obtained and a person having ordinary skill in the art at the time of invention would have appreciated that progressively smaller nanoflakes allows for the miniaturization of devices in which those nanoflakes can be used, such as field emission detectors. Shang, Page 187, Col. 2.

With respect to **claim 64**, Shang, Peigney and Mack, as combined above, teach that the carbon nanoflakes have a thickness of 0.34 nanometers, which is less than 2. Mack, Claim 16. Additionally, a person having ordinary skill in the art at the time of invention would have appreciated that the specific surface area of a structure is a result effective variable that can be optimized to increase the performance of that structure. For example, the specific surface area of the carbon nanostructure could be increased to increase its hydrogen absorption capacity. Accordingly, as per the MPEP, where the general conditions of a claim are disclosed in the prior art it is not inventive to discover the optimal ranges by routine experimentation. MPEP 2144.05(II)(A). Here, Peigney

Art Unit: 1793

discloses the importance of specific surface area and increasing the specific surface area simply involves optimizing the teachings of Peigney to attain a desired specific surface area to achieve, for example, a desired hydrogen absorption when the nanoflake is used in a hydrogen absorption device.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ELI MEKHLIN whose telephone number is (571)270-7597. The examiner can normally be reached on 5/4/9.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jerry Lorengo can be reached on 571-272-1233. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Art Unit: 1793

/ELI MEKHLIN/  
Examiner, Art Unit 1793

/J.A. LORENZO/  
Supervisory Patent Examiner, Art  
Unit 1793